PROCEEDINGS

OF THE

ROYAL SOCIETY OF LONDON

SERIES A

CONTAINING PAPERS OF A MATHEMATICAL AND PHYSICAL CHARACTER.

VOL. XCV.

LONDON:

PRINTED FOR THE ROYAL SOCIETY AND SOLD BY
HARRISON AND SONS, ST. MARTIN'S LANE,
PRINTERS IN ORDINARY TO HIS MAJESTY.

JULY, 1919.

LONDON
HARRISON AND SONS, PRINTERS IN ORDINARY TO HIS MAJESTY,
ST. MARTIN'S LANE.

CONTENTS.

SERIES A. VOL. XCIV.

No. A 665.—September 2, 1918.

PAGE

Curved Beams. By James J. Guest, University College, London. Communicated by Prof. W. E. Dalby, F.R.S. 1

On the Cesàro Convergence of Restricted Fourier Series. By W. H. Young, F.R.S. 22

On the Electrical Resolution and Broadening of Helium Lines. By Thomas R. Merton, D.Sc., Lecturer in Spectroscopy at the University of London, King's College. Communicated by Prof. A. Fowler, F.R.S. 30

Periodic Irrotational Waves of Finite Height. By T. H. Havelock, F.R.S. 38

Experiments on the Effect of the Vibration of a Stretched Wire forming Part of a Closed Electric Circuit. By Admiral Sir Henry Jackson, G.C.B., F.R.S. 51

The Diamagnetism of Hydrogen and the Value of the Magneton. By Major A. E. Oxley, R.F.C., M.A., D.Sc. Communicated by Prof. J. W. Nicholson, F.R.S. 58

No. A 666.—October 7, 1918.

An Outline of a Theory of Magnetic Storms. By S. Chapman, M.A., D.Sc., Fellow and Lecturer of Trinity College, Cambridge, and Chief Assistant at the Royal Observatory, Greenwich. Communicated by Sir F. W. Dyson, F.R.S., Astronomer Royal 61

The Diffraction of Electric Waves by the Earth. By G. N. Watson, Sc.D., D.Sc., Assistant Professor of Pure Mathematics at University College, London. Communicated by Prof. J. W. Nicholson, F.R.S. 83

Note on the Effect of Wind Pressure on the Pitch of Organ Pipes. By A. Mallock, F.R.S. 99

The Periods of Lateral Vibration of Loaded Shafts.—The Rational Derivation of Dunkerley's Empirical Rule for Determining Whirling Speeds. By H. H. Jeffcott, B.A., B.A.I., Professor of Engineering, Royal College of Science for Ireland. Communicated by Prof. W. McF. Orr, F.R.S. 106

On the Spectrum of Cadmium in the Inactive Gases. By J. N. Collie, F.R.S., and H. E. Watson, D.Sc. 115

Further Experiments on Spontaneous Generation of Heat in Recently Hardened Steel. By Charles F. Brush, Sir Robert A. Hadfield, Bt., F.R.S., and S. A. Main, B.Sc. 120

PAGE

No. A 667.—November 7, 1918.

Sounds Produced by Drops Falling on Water. By A. Mallock, F.R.S. (Plate 1)... 138

On the Coefficients in the Expansions of Certain Modular Functions. By G. H. Hardy, F.R.S., and S. Ramanujan, F.R.S. 144

The Light Scattered by Gases: its Polarisation and Intensity. By the Hon. R. J. Strutt, F.R.S., Professor of Physics, Imperial College, South Kensington. (Plate 2) 155

No. A 668.—January 1, 1919.

On Haidinger's Rings in Mica. By T. K. Chinmayanandam, M.A. (Hons.). Communicated by Dr. Gilbert T. Walker, C.S.I., D.Sc., F.R.S. 176

The Thermal Conductivity of Air. By E. O. Hercus, M.Sc., New Zealand Government Research Scholar, and T. H. Laby, M.A., Professor of Natural Philosophy, University of Melbourne. Communicated by Sir Joseph Larmor, F.R.S. 190

Electric Potential Gradient and Atmospheric Opacity at Kew Observatory. By C. Chree, Sc.D., LL.D., F.R.S. 210

On the Nature of Sun-Spots. By George E. Hale, For. Mem. R.S. (Abstract) 234

On Non-harmonic Trigonometrical Series. By Prof. W. H. Young, Sc.D., F.R.S.... 237

No. A 669.—February 1, 1919.

Address of the President, Sir J. J. Thomson, O.M., at the Anniversary Meeting, November 30, 1918 250

An Investigation of Extreme Ultra-violet Spectra, with a Vacuum-grating Spectrograph. By J. C. McLennan, F.R.S., and Mr. R. J. Lang, M.A., University of Toronto. (Plate 3) 258

On the Absorption Spectra and the Ionisation Potentials of Calcium, Strontium, and Barium. By J. C. McLennan, F.R.S., and J. F. T. Young, M.A., University of Toronto. (Plates 4–6) 273

Emission and Absorption in the Infra-red Spectra of Mercury, Zinc, and Cadmium. By Raymond C. Dearle, M.A., University of Toronto. Communicated by Prof. J. C. McLennan, F.R.S. 280

On the Value of the Secular Acceleration of the Mean Longitude of the Moon. By E. Nevill, F.R.S. 300

A Study of the Forms assumed by Drops and Vortices of a Gelatinising Liquid in Various Coagulating Solutions. By Emil Hatschek. Communicated by Prof. D'Arcy Thompson, F.R.S. 303

No. A 670.—March 15, 1919.

Vacuum Arc Spectra of various Elements in the Extreme Ultra-violet. By Prof. J. C. McLennan, F.R.S.; D. S. Ainslie, M.A.; and D. S. Fuller, M.A., University of Toronto. (Plates 7–10) 316

PAGE

An Investigation of the Ionising Power of the Positive Ions from a Glowing Tantalum Filament in Helium. By Frank Horton, Sc.D., Professor of Physics in the University of London, and Ann Catherine Davies, M.Sc., Royal Holloway College, Englefield Green. Communicated by Mr. C. T. R. Wilson, F.R.S. 333

Wave Resistance : Some Cases of Three-dimensional Fluid Motion. By T. H. Havelock, F.R.S. 354

Experiments Demonstrating an Electrical Effect in Vibrating Metals. By Admiral Sir H. B. Jackson, G.C.B., F.R.S., and G. B. Bryan, D.Sc. 366

No. A 671.—April 1, 1919.

Chances of Loss of Merchant Ships. By W. S. Abell, Chief Ship Surveyor, Lloyd's Register of Shipping. Communicated by Prof. W. Burnside, F.R.S. ... 383

Contribution to the Theory of Attraction when the Force Varies as any Power of the Distance. By Major P. A. MacMahon, F.R.S., and H. B. C. Darling 390

On the Cause of Hierarchical Order among the Correlation Coefficients of a Number of Variates Taken in Pairs. By Godfrey H. Thomson, D.Sc., Armstrong College, in the University of Durham. Communicated by Prof. T. H. Havelock, F.R.S. 400

An Experimental Determination of the Ionisation Potential for Electrons in Helium. By Frank Horton, Sc.D., Professor of Physics in the University of London, and Ann Catherine Davies, M.Sc., Royal Holloway College, Englefield Green. Communicated by Mr. C. T. R. Wilson, F.R.S. 408

Note on the Elasticity of Metals as Affected by Temperature. By A. Mallock, F.R.S. 429

No. A 672.—June 4, 1919.

On the Arc Spectrum of Scandium. By Sir William Crookes, O.M., D.Sc., F.R.S. (Plate 11)..... 438

Vibration and Srength of Struts and Continuous Beams under End Thrusts. By W. L. Cowley, A.R.C.Sc., D.I.C., and H. Levy, M.A., B.Sc., F.R.S E. Communicated by Sir R. Glazebrook, F.R.S. 440

Two-dimensional Solutions of Poisson's and Laplace's Equations. Part I.—By Leonard Bairstow, F.R.S., C.B.E. Part II.—By Arthur Berry, M.A., Fellow of King's College, Cambridge 457

Scattering of Light by Solid Substances. By the Hon. R. J. Strutt, F.R.S., Imperial College, South Kensington. (Plate 12) 476

A New Method of Weighing Colloidal Particles. By E. F. Burton, Ph.D., Associate Professor of Physics, University of Toronto. Communicated by Prof. J. C. McLennan, F.R.S. 480

The Constitution of Sulphur Vapour. By Sir James J. Dobbie, F.R.S., and J. J. Fox, M.B.E., D.Sc. (Plates 13 and 14) 484

PAGE

No. A 673.—July 15, 1919.

An Apparatus for the Direct Determination of Accelerations. By the late Prince B. Galitzin, For.Mem.R.S. 492

On the Explosion at Okhta. By the late Prince B. Galitzin, For.Mem.R.S. 508

The Two-Dimensional Motion of a Plane Lamina in a Resisting Medium. By S. Brodetsky, M.A., Ph.D. Communicated by Prof. G. H. Bryan, F.R.S. 516

A New Method for the Absolute Determination of Frequency. By Ashutosh Dey, with a Prefatory Note and an Appendix by C. V. Raman, M.A., Palit Professor of Physics in the Calcutta University. Communicated by Dr. Gilbert T. Walker, C.S.I., Sc.D., F.R.S. 533

The Transmission of Electric Waves round the Earth. By G. N. Watson, Sc.D., D.Sc., Professor of Mathematics in the University of Birmingham. Communicated by Prof. J. W. Nicholson, F.R.S. 546

OBITUARY NOTICES OF FELLOWS DECEASED.

Keith Lucas (with portrait); Hugo Müller (with portrait); Bertram Hopkinson (with portrait) ..... i—xxxvi

Index xxxvii